

PCT/EP03/10294  
DSM IP ASSETS B.V.

**Claims:**

1. A process for producing canthaxanthin and echinenone which comprises cultivating a recombinant microorganism which is expressing a  $\beta$ -carotene ketolase gene and belonging to the genus *Xanthophyllomyces* (*Phaffia*) and which accumulates  $\beta$ -carotene in an aqueous nutrient medium under aerobic conditions, and isolating the resulted carotenoids from the cells of said recombinant microorganism or from the cultured broth, wherein the  $\beta$ -carotene ketolase gene is originated from a microorganism which is selected from the group consisting of microorganisms of the genera *Agrobacterium*, *Alcaligenes*, *Paracoccus* and *Haematococcus* having the  $\beta$ -carotene ketolase gene.
2. The process according to claim 1, wherein the recombinant microorganism is derived from *Xanthophyllomyces dendrorhous* (*Phaffia rhodozyma*) ATCC96815, or a mutant thereof.
3. The process according to claim 1, wherein the  $\beta$ -carotene ketolase gene is originated from a microorganism which is selected from the group consisting of *Agrobacterium aurantiacum*, *Alcaligenes* PC-1, *Paracoccus marcusii* MH1, a gram-negative bacteria E-396 (FERM BP-4283), and *Haematococcus pluvialis*, having the  $\beta$ -carotene ketolase gene.
4. The process according to claim 1, wherein the  $\beta$ -carotene ketolase gene is originated from *Alcaligenes* PC-1 or the DNA sequence of the  $\beta$ -carotene ketolase gene is substantially homologous thereto.
5. The process according to claim 1, wherein the  $\beta$ -carotene ketolase gene is expressed in the recombinant microorganism using the control sequences.
6. The process according to claim 1, wherein the cultivation is carried out at a pH in the range of from 3 to 7 and at a temperature in the range of from 15 to 26°C for 24 to 500 hours.

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**AMENDED SHEET**

7. The process according to claim 7, wherein the cultivation is carried out at a pH in the range of from 5 to 7 and at a temperature in the range of from 18 to 22°C for 48 to 350 hours.

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